

REMARKS

Claims 2-4, 6, 10-13 and 16-21 are pending in this Application. By this Amendment, claims 2-4, 6 and 10 are amended, new claims 16-21 are added, and claims 1, 5, 7-9, 14 and 15 are canceled without prejudice or disclaimer. Reconsideration in view of the above-amendments and following remarks is respectfully requested.

The attached Appendix includes marked-up copies of each rewritten claim (37 C.F.R. §1.121(c)(1)(ii)).

At the outset, Applicants gratefully acknowledge that the Office Action indicates that claims 10 and 11 contain allowable subject matter. However, for at least the reasons described above, Applicants believe that the rest of the pending claims also contain allowable subject matter.

The Office Action rejects claims 5 and 12 under 35 U.S.C. §112, second paragraph as being indefinite. Upon review of the Application, Applicants believe that this rejection was intended to be directed to claims 5 and 14, and therefore will respond accordingly. However, based on the cancellation of claims 5 and 14, this rejection is now moot.

The Office Action rejects claims 1, 3-5, 7-9 and 12 under 35 U.S.C. 103(a) as being unpatentable over Gerber (WO 94/29897) in view of Hayden (U.S. Patent No. 6,019,271) and claims 2 and 6 under 35 U.S.C. §103(a) as being unpatentable over Gerber in view of Hayden and further in view of DiStefano (U.S. Patent No. 6,222,152). In view of the above amendments, the rejections as they apply to the now canceled claims are now moot. However, with respect to the still pending claims, Applicants respectfully traverse these rejections.

In particular, Applicants assert that neither Gerber, Hayden or DiStefano, either alone or in combination, disclose or suggest a process for manufacturing a multilayer flexible wiring board including at least contacting the tip of an ultrasonic resonator with an exposed

opposite side of a portion to be bonded of a metal wiring of at least one flexible wiring board piece of the two flexible wiring board pieces to be bonded, as recited in independent claim 2, and similarly recited within the context of independent claim 16.

Further, neither Gerber, Hayden or DiStefano, either alone or in combination disclose or suggest a multilayer flexible wiring board wherein a metal base of at least one flexible wiring board piece has a second opening in which a metal wiring exists at the bottom so that metal wirings are bonded to each other by applying ultrasonic waves while the metal wiring of another flexible wiring board piece is in close contact with the metal wirings located at the bottom of the second opening, as recited in independent claim 12.

Specifically, Gerber discloses a method for providing electrical interconnections between adjacent circuit board layers that are laminated together under heat and pressure. See, for example page 10, lines 25-28. The Office Action admits that Gerber does not teach that an ultrasonic process can be used to ultrasonically bond the one or more boards together.

In order to overcome the above noted deficiency, the Office Action relies on Hayden, which discloses a method for ultrasonically bonding flexible circuits. However, in stark contrast to Applicants' claimed invention, Hayden does not disclose or suggest contacting the tip of an ultrasonic resonator with an exposed opposite side of a portion to be bonded of metal wirings of at least one flexible wiring board piece of the two flexible wiring board pieces to be bonded. Further, Hayden does not teach or suggest that one of the flexible wiring board pieces includes a second opening in which a metal wiring exists at the bottom, so that metal wirings are bonded to each other by applying ultrasonic waves while the metal wiring of another flexible wiring board piece is in close contact with the metal wiring located at the bottom of the second opening.

Further, Applicants assert that the combination of Gerber and DiStefano is improper, because such a combination would result in an inoperative device and/or method. For

example, in Gerber, heat and pressure are simultaneously applied to connect circuit board layers and adhere adhesive layers. If the method of lamination for a circuit board layer described in Gerber were carried out by using bonding tool 60, as described in DiStefano, ultrasonic waves generated by the bonding tool 60 must be applied to each of the adhesive layers and the wirings. Therefore, it would be impossible for bonding tool 60, such as the one described in DiStefano, to apply ultrasonic waves to each of the adhesive layers and wirings.

Assuming arguendo that it is possible to carry out applying the ultrasonic wave, a device that uses bonding tool 60 of DiStefano with the circuit board layers of Gerber is different from the present claimed invention, because in such a bonding method the ultrasonic waves applied to the adhesive layer would also indirectly reach the metal wirings. While, at least independent claims 2 and 16 recite contacting a tip of an ultrasonic resonator to metal wiring of flexible wiring board and applying an ultrasonic wave.

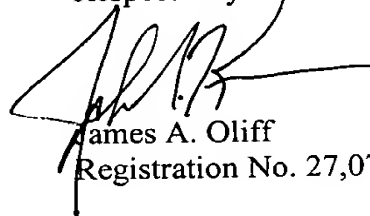
Applicants point out that claim 10 has been amended to now be in independent form by including the limitations of now canceled independent claim 7. Accordingly, in view of the Office Action indication of allowability, Applicants believe that independent claim 10 is now in condition for allowance.

Therefore, Applicants submit that independent claims 2, 10, 12 and 16 define patentable subject matter. Claims 3-4, 6, 11, 13 and 17-21 depend from independent claims 2, 10 and 12, respectively, and therefore also define patentable subject matter. Accordingly, Applicants respectfully request that the rejections under 35 U.S.C. §112, second paragraph, and §103(a) be withdrawn.

In view of the foregoing amendments and remarks, Applicants submit that this Application is in condition for allowance. Favorable consideration and prompt allowance of the claims are earnestly solicited.

Should the Examiner believe that anything further would be desirable to place this Application in better condition for allowance, the Examiner is invited to contact Applicants undersigned attorney at the telephone number listed below.

Respectfully submitted,



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Attachment:
Appendix

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<p>DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461</p>
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APPENDIX

Changes to Claims:

Claims 1, 5, 7, 8, 9, 14 and 15 are canceled.

The following are marked-up versions of the amended claims:

2. (Amended) A process for manufacturing a multiplayer flexible wiring board by bonding metal wirings of at least two flexible wiring board pieces having a base film including a resin film and a metal wiring provided on said base film, said process comprising:

- _____ contacting the tip of an ultrasonic resonator with ~~the~~an exposed opposite side of a portion to be bonded of said metal wirings of at least one flexible wiring board piece ~~in~~of two flexible wiring board pieces to be bonded;; and
- _____ applying ultrasonic wave to said ultrasonic resonator to bond said two metal wirings to be bonded.

3. (Amended) The process according to claim ~~1~~2, wherein ultrasonic wave is applied to said metal wirings in close contact with each other at their surfaces while a thermoplastic resin layer developing adhesiveness upon heating is placed between said metal wirings.

4. (Amended) The process according to claim 3, wherein said metal wirings are ultrasonically bonded and then heated to laminate said flexible wiring board pieces by the adhesion of said thermoplastic resin.

6. (Amended) The process according to claim ~~1~~2, wherein ultrasonic wave is individually applied to the parts of said metal wirings to be bonded.

10. (Amended) ~~A~~The multiplayer flexible wiring board ~~according to claim 7 that~~
is formed by laminating at least two flexible wiring board pieces having a base film and a metal wiring provided on said base film, wherein at least one flexible wiring board piece has a cover film including a resin film on said metal wiring and a first opening is provided on

said cover film, and said metal wiring exists at the bottom of said first opening so that said metal wirings of said flexible wiring board pieces are bonded to each other by applying ultrasonic wave while the part of said metal wiring located at the bottom of said first opening is in close contact with said metal wiring of the other flexible wiring board piece, and further
wherein said first opening and said metal wiring located at the bottom of said first opening form a concave, and the part of said metal wiring of the other flexible wiring board piece to be bonded to said concave forms convex on said base film.

Claims 16-21 are added.